AEROSPACE STANDARD

AS17852™	REV. A

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Superseding AS17852

(R) Reducers, Oxygen Pressure

FSC 1660

RATIONALE

AS17852A has been reaffirmed to comply with the SAE Five-Year Review policy.

1. SCOPE

1.1 Scope

This specification covers the requirements for two types of oxygen pressure reducers.

1.2 Classification

Reducers covered by this specification shall be of the following types, as specified (see 6.2).

Type I - On - Off
Type II - Emergency

2. APPLICABLE DOCUMENTS

2.1 Issues of Documents

The following documents of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

FEDERAL SPECIFICATIONS

BB-A-1034	Air, Compressed, for Breathing Purposes
A-A-59503	Nitrogen, Technical
A-A-58092	Tape, Antiseize, Polytetrafluorethylene
PPP-B-576	Boxes, Wood-Cleated Panelboard

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
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MILITARY SPECIFICATIONS and STANDARDS

MIL-DTL-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-B-22191	Barrier Material, Transparent, Flexible, Heat Sealable
MIL-PRF-27210	Oxygen, Aviator's Breathing Liquid and Gas
MIL-STD-2073	Standard Practice for Military Packaging
MIL-STD-1916	DOD Preferred Methods for Acceptance of Product
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-143	Standards and Specifications, Order of Precedence for the Selection of
MIL-STD-889	Dissimilar Metals
7-104.55	Defense Acquisition Regulation

SAE STANDARDS and RECOMMENDED PRACTICES

ARP1176	Oxygen System and Component Cleaning and Packaging
AIR5742	Packaging and Transportation of Oxygen Equipment
AS8010	Aviator's Breathing Oxygen Purity Standard
AS8879	Screw Threads - UNJ Profile, Inch Controlled Radius Root with Increased Minor Diameter
AS71051	Pipe Threads, Taper, Aeronautical National Form, Symbol ANPT - Design and Inspection Standard
AMS-QQ-P-35	Passivation Treatments for Corrosion-Resistant Steel

ASTM STANDARDS

ASTM D 1974	Standard Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes
ASTM D 5168	Standard Practice for Fabrication and Closure of Triple-Wall Corrugated Fiberboard Containers
ASTM D 5486	Standard Specification for Pressure-Sensitive Tape for Packaging, Box Closure, and Sealing
ASTM A967	Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts

ATA

SPEC2000	E-Business Specification for Materials Management

(Copies of specifications, standards, drawings and publications required by contractors in connection with specific acquisition functions should be obtained from the acquiring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 First Article

When specified, a sample shall be subjected to first article inspection (see 4.3 and 6.4).

3.2 Selection of Specifications and Standards

Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143 where applicable.

3.3 Materials

Materials shall conform to applicable specifications and shall be as specified herein and on applicable drawings. Materials which are not covered by specifications, or which are not specifically described herein, shall be of the required quality, of the lightest practicable weight, and suitable for the purpose intended.

3.3.1 Metal Parts

All metal parts shall be of a corrosion resistant material or treated in a manner to render them adequately resistant to corrosion.

3.3.1.1 Dissimilar Metals

Dissimilar metals, such as defined in MIL-STD-889, shall not be used in intimate contact with each other unless suitably protected against electrolytic corrosion with protective coatings.

3.3.2 Nonmetallic Materials

Any nonmetallic material that is adversely affected by continued use with oxygen shall not be used.

3.3.2.1 Age

Elastomeric components, except silicone, shall not be more than 12 months old from the cure date of manufacture to the date of delivery to any Government Service or to any airframe or accessory manufacturer unless otherwise specified by contractual agreement. In such instances, the manufacturer must have demonstrated sufficient evidence that the elastomer will perform without degradation over a defined period of time.

3.3.2.2 Fungus-Proof Materials

Materials which are not nutrients for fungi shall be used to the greatest extent practicable. In cases where materials that are nutrients for fungi must be used, such materials shall be treated with an oxygen-compatible fungicidal agent, as approved by the acquiring activity (see 6.2). These fungicidal agents must also be non-toxic to humans under the conditions of exposure expected when using the pressure reducer.

3.3.3 Protective Treatment

When materials are used in the construction of the reducers that are subject to deterioration when exposed to environmental conditions likely to occur during service usage, they shall be protected against such deterioration in a manner that will in no way prevent compliance with the performance requirements of this specification. Protective coating which might crack, chip, or scale during normal service life or under extremes of environmental conditions shall not be used. All materials and processes shall be compatible with oxygen environments.

3.4 Standard Parts

AS, MS, and AN standard parts shall be used where they suit the purpose. They shall be identified on the manufacturer's drawings by their part numbers. Parts which are not covered by specifications or military standards, or which are not specifically described herein or on the drawings, shall be completely described on manufacturer's drawings.

3.5 Design and Construction

3.5.1 Type I

The reducer shall be of the type suitable in all respects for use in aircraft oxygen systems and shall operate at supply pressures of 250 to 2400 psig, unless otherwise specified in the procurement specification which shall define the range of supply pressures uniquely required by the application. The outlet pressure shall be a predetermined fixed pressure within the range of 80 psig ± 10 psig for oxygen flow rates from 0 to 140 lpm (NTPD), unless otherwise specified in the procurement specification which shall define the range of supply pressures and flows uniquely required by the application.

3.5.1.1 Mounting

The reducer shall be designed for permanent mounting on the airplane console. The location of the mounting holes shall have sufficient clearance between the mounting and inlet and outlet ports to allow for easy connection of fittings.

3.5.1.2 Shut-Off Feature

The reducer shall be provided with a shut-off feature which shall be capable of allowing the flow to be turned on or off. The shut-off feature shall be provided with a handle so that the valve may be actuated with one hand.

3.5.1.3 Ports

The reducer shall be provided with industry standard AS, MS, or AN ports and fittings for the inlet, relief, outlet, and fill connections. Pipe threads shall be avoided where possible, but if required, shall conform to 1/8-in internal pipe threads per AS71051. Ports shall be clearly visible and functions permanently marked where possible.

3.5.2 Type II

The reducer shall be capable of reducing emergency oxygen between the pressures of 250 and 1800 psig, unless otherwise specified in the procurement specification which shall define the range of supply pressures uniquely required by the application. The outlet pressure shall be a predetermined fixed pressure within the range of 45 to 80 psig for oxygen flow rates from 0 to 140 lpm (NTPD), unless otherwise specified in the procurement specification which shall define the range of supply pressures and flows uniquely required by the application.

3.5.2.1 Emergency Supply Release Assembly Shut-Off Valve

The emergency reducer shall be provided with a manual and automatic emergency supply release assembly. The valve shall be designed so that it may be actuated with one hand. The assembly may consist of a common pin or disc attached to two pull cable assemblies. One pull cable assembly, for manual release, shall be attached to a ball handle (preferably green in color); the other pull cable, for automatic release, shall be attached to the aircraft structure. A means shall be provided to prevent accidental actuation of the oxygen supply during an emergency aircraft egress event. The emergency supply release assembly, when engaged, shall prevent operation of the reducer.

3.5.2.2 Ports

The reducer shall be provided with industry standard AS, MS, or AN ports and fittings for the inlet, relief, outlet, and fill connections, as specified by the acquiring activity (see 6.2). Pipe threads shall be avoided where possible, but if required, shall conform to 1/8-in internal pipe threads per AS71051 for the relief and outlet ports. Ports shall be clearly visible and functions permanently marked where possible.

3.5.3 Types I and II

The reducer shall not induce or sustain audible oscillation or vibration, accompanied by rapid fluctuations in outlet pressure or flow, within its operating range of pressure and flow, nor shall it sustain such oscillation induced by the aircraft vibration spectrum as specified in 4.6.8.

3.5.3.1 Filter

A filter consisting of a 74 micron rating sintered bronze, a monel or stainless steel 200 mesh wire screen, or equivalent shall be firmly secured in the high pressure oxygen inlet of the reducer. The filter shall be easily removable for cleaning and replacement.

3.5.3.2 Orientation

The reducer shall operate satisfactorily in any orientation in which it is mounted (see 4.5.3).

3.5.3.3 Antiseize Tape

Antiseize tape shall be used on all male pipe thread fittings. Antiseize tape shall conform to, and shall be applied as specified in, A-A-58092. Tape shall NOT be used on straight flare tube fitting threads, coupling sleeves, on the outer side of tube flares, or on any other style fitting that is not a pipe thread. None of the tape shall be allowed to enter the inside of a fitting where it could enter the oxygen flow path, as it creates an oxygen fire hazard and could lead to flow restrictions.

3.5.3.4 Cleaning, Degreasing, and Non-Volatile Residue

Prior to assembly, all reducer components shall be cleaned degreased, and a Non-Volatile Residue (NVR) test shall be performed in accordance with ARP1176, and per the cleanliness level specified in the procurement specification.

3.6 Performance

3.6.1 Leakage

The reducer, when tested as specified in 4.6.2, shall not show any evidence of leakage as evidenced by the presence of sustained bubbles, unless otherwise specified in the procurement specification.

3.6.2 Pressure and Flow

3.6.2.1 Type I

The outlet pressure of the reducer, when tested as specified in 4.6.3.1, shall at no time be less than 70 psig nor greater than 90 psig, unless otherwise specified in the procurement specification.

3.6.2.2 Type II

The outlet pressure of the reducer, when tested as specified in 4.6.3.2, shall at no time be less than 45 psig nor greater than 80 psig, unless otherwise specified in the procurement specification.

3.6.3 Shut-Off Valve

3.6.3.1 Type I

The shut-off valve on the reducer, when tested as specified in 4.6.4.1, shall permit a minimum oxygen flow of 140 lpm (NTPD) in the “on” position, and shall not allow any flow when the valve is in the “off” position, unless otherwise specified in the procurement specification. The maximum torque required to turn the valve on or off shall be 15 in-lb, unless otherwise specified in the procurement specification.

3.6.3.2 Type II

The emergency supply release shut-off valve on the reducer, when tested as specified in 4.6.4.2, shall permit a minimum oxygen flow of 140 lpm (NTPD) when actuated and shall not allow any flow when engaged, unless otherwise specified in the procurement specification. The pull force required to actuate the emergency supply release assembly shall be a minimum of 10 lb and a maximum of 28 lb, unless otherwise specified in the procurement specification.

3.6.4 Pressure Relief

The pressure relief valve, when tested as specified in 4.6.5, shall open at 120 psig ± 10 psig and shall allow a minimum oxygen flow of 80 lpm at 130 psig through the valve, unless otherwise specified in the procurement specification. The pressure relief valve shall reseat at 110 psig minimum, unless otherwise specified in the procurement specification, and show no evidence of leakage when leak detection fluid is applied and monitored over a minumum of 15 min, as evidenced by the presence of sustained bubbles, unless otherwise specified in the procurement specification.

3.6.5 Proof Pressure

The reducer, when tested as specified in 4.6.6, shall show no evidence of leakage when leak detection fluid is applied and monitored over a minimum of 15 min, as evidenced by the presence of sustained bubbles, unless otherwise specified in the procurement specification. No evidence of permanent damage, distortion, or functional degradation after proof testing is allowed.

3.6.6 High and Low Temperature Operation

The reducer, when tested as specified in 4.6.7 shall operate without failure and shall show no evidence of mechanical or material failure, nor functional degradation beyond specification performance limits.

3.6.7 Vibration

The reducer, when tested as specified in 4.6.8, shall show no evidence of mechanical or material failure, nor functional degradation beyond specification performance limits.

3.6.8 Endurance (Type I)

The on-off shut off valve, when tested as specified in 4.6.9, shall operate satisfactorily.

3.6.9 Oxygen Slam-Start Test

The reducer, when tested as specified in 4.6.10, shall not ignite, nor shall there be any evidence of charring or deterioration.

3.7 Interchangeability

All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable.

3.8 Dimensions

3.8.1 Type I

The reducer shall have maximum overall dimensions of 4.25 by 1.50 by 1.50 in, or as defined in the procurement specification.

3.8.2 Type II

The reducer shall have maximum overall dimensions of 3.00 by 2.25 by 1.50 in, or as defined in the procurement specification.

3.9 Weight

The weight of the pressure reducing valve shall not exceed 0.4 lb, or as defined in the procurement specification. The weight shall be as low as possible, considering materials selection commensurate with oxygen safety requirements.

3.10 Threads

3.10.1 Screw

Machine screw threads shall be in accordance with AS8879 or applicable industry standards.

3.10.2 Pipe

Pipe threads shall be avoided if possible, however, if used, shall be in accordance with AS71051.

3.11 Finish

Aluminum and aluminum alloys shall be anodized in accordance with MIL-A-8625 or chemically conversion coated in accordance with MIL-DTL-5541. Stainless steel alloys shall be passivated in accordance with applicable material requirements per AMS-QQ-P-35 or ASTM A 967.

3.12 Identification of Product

The valves shall be marked for identification in accordance with specific program requirements. ATA Spec2000 shall be used where feasible. MIL-STD-130 may be used, except that the National Stock Number shall be omitted from the nameplate.

3.12.1 Nameplate

The following are examples of nameplate format. Format and information to be included shall be as defined in the procurement specification:

Example 1 per ATA Spec2000:

REDUCER, OXYGEN PRESSURE
(Data Matrix/Barcode) MFR xxxxx
(Data Matrix/Barcode) SER YY-xxxxxx
(Data Matrix/Barcode) PNR xxxxxx
(Data Matrix/Barcode) DMF MMYYYY

Example 2 per MIL-STD-130:

REDUCER, OXYGEN PRESSURE
AS17852A
Contract or Order No.
Manufacturer's Part No.
Manufacturer's Name or Trade Mark

3.13 Workmanship

The reducer shall be uniform in quality and shall be free from irregularities, defects or foreign matter which could adversely affect safety, performance, reliability or durability.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the purchaser. The purchaser reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of Inspection

The inspection requirements specified herein are classified as follows:

a. First article inspection. First article inspection consists of examinations and tests performed on samples which are representative of the production item after award of a contract to determine that the production item meets the requirements of this and all applicable specifications (see 4.3).

b. Quality conformance inspection. Quality conformance inspection consists of examinations and tests performed on individual products or lots to determine conformance of the products or lots with the requirements set forth in this and all applicable specifications (see 4.4).

4.3 First Article Inspection

First article inspection may consist of the following examinations and tests, with additions and/or deletions based upon specific program requirements:

Inspection	Test Method
Visual examination	4.6.1
Dimensions	4.6.1.1.1
Leakage	4.6.2
Pressure and Flow	4.6.3
Shut-off valve	4.6.4
Pressure Relief	4.6.5
Proof Pressure	4.6.6.1
Burst Pressure	4.6.6.2
High and Low Temperature Operation	4.6.7
Vibration	
Endurance (Type I)	4.6.8
Oxygen Slam-Start	4.6.9
	4.6.10

4.3.1 First Article Samples

Unless otherwise specified, as soon as practicable after the award of the contract or order, the manufacturer shall submit the first article sample(s). The sample(s) shall be representative of the construction, workmanship, components and materials to be used during production. When a manufacturer is in continuous production of these units from contract to contract, submission of further first article samples on the new contract may be waived at the discretion of the acquiring activity (see 6.2). Approval of the first article samples or the waiving of first article inspection does not exclude the requirements of submitting to the quality conformance inspection. The first article inspection samples shall be furnished to the purchaser as directed by the contracting officer or as defined in the program specification (see 6.2).

4.3.1.1 First Article Information

Upon completion of the first article inspection, all of the applicable inspection reports and when applicable, recommendations and comments pertinent for use in monitoring production, will be forwarded to the cognizant purchasing agent. Reducer(s) may or may not be returned to the manufacturer for use in monitoring production, based upon specific contract stipulations. Samples consumed or destroyed in the first article inspection will not be considered as part of the quantity to be delivered under contract.

4.4 Quality Conformance Inspection

The sampling and inspection levels shall conform to MIL-STD-1916 and/or specific contract requirements. Quality conformance inspection shall be as specified in Table 1 or as defined in contract.

4.4.1 Sampling

4.4.1.1 Inspection Lot

4.4.1.1.1 Reducer

An inspection lot size shall be expressed in units of reducers, made essentially under the same conditions and from the same materials and components. The sample unit shall be one reducer or as specifically defined in the contract.

4.4.1.1.2 Packaging

An inspection lot size shall be expressed in units of one fully prepared shipping container, containing reducers of one type, fully prepared for delivery, made from essentially the same materials and components. The sample unit shall be one shipping container, containing reducers of one type, fully prepared for delivery, with the exception that it need not be sealed.

4.4.1.2 Sampling for Tests and Examinations of Reducers

The sample size, acceptance criteria, tests and examinations required for the reducers shall be as specified in Table 1 or as specified in the contract.

4.5 Test Condition

4.5.1 Temperature and Pressure

Unless otherwise specified, tests shall be conducted at local ambient temperature and barometric pressure. The temperature and barometric pressure shall be recorded at the time of inspection. This information shall be available for computation of test data, where required, to normal temperature and pressure dry (NTPD) conditions. NTPD conditions are 29.92 in of mercury (101.3 kPa) and 21 °C (70 °F). Test instruments shall be calibrated or adjusted according to their required usage in conducting individual tests.

4.5.2 Gas

Unless otherwise specified, the gas media used in testing the reducers shall be Oxygen conforming to MIL-PRF-27210, Type I, or AS8010, Type I, except for proof pressure testing which should never be performed with oxygen due to the safety hazard present at elevated pressures, and vibration/shock which expose the components to environments not safe for oxygen use. When specified, Nitrogen conforming to A-A-59503, Type I, Grade A, Class 1, or Air conforming to BB-A-1034, Source I or II, Grade A, may be used. Appropriate conversion factors for flow and leakage shall be applied for all equipment used and to resulting test data obtained.

4.5.3 Orientation

When subjected to the test specified in 4.6.3, the reducers shall be positioned with the centerline of the outlet passage parallel to a particular plane or defining axis. For each consecutive orientation test conducted, the reducer shall be rotated 90 degrees about axes perpendicular to the first axis, thus achieving three mutually perpendicular orthogonal orientations.

4.6 Inspection Methods

4.6.1 Visual Examination

4.6.1.1 Reducer

Every reducer shall be examined visually for critical defects to determine conformance to this specification. Every reducer, selected as a sample unit from the lot, shall be visually examined for minor defects to determine conformance to this specification. The classification of defects, Table 2, shall be used to classify the defects found.

4.6.1.1.1 Dimensions

The reducers shall be checked dimensionally to determine conformance to the dimensions specified herein and/or per applicable drawings.

4.6.1.2 Packaging

Each of the fully prepared shipping containers, containing reducers of one type, selected as a sample unit from the lot, shall be examined to determine that the packaging, packing, and marking conform to this and all applicable specifications. The classification of defects, Table 3, shall be used to enumerate the defects found.

4.6.2 Leakage

The outlet of the reducer shall be sealed with a suitable plug or cap. The reducer shall be actuated and a pressure of 1800 psig shall then be applied to the inlet of the reducer and maintained for a period of 15 min minimum. During this period, leak detection fluid shall be applied to all reducer connections and sealed ports, and monitored for leakage as evidenced by the presence of sustained bubbles. The reducer shall pass the requirements specified in 3.6.1.

4.6.3 Pressure and Flow

4.6.3.1 Type I

The reducer shall be preset at 80 psig (or at the pressure defined in the applicable specification) and the inlet connected to an appropriate oxygen, nitrogen, or air pressure source. The reducer shall then be subjected to an inlet pressure of 2400 psig and the flow at the reducer outlet shall be varied from 0 to 140 lpm (NTPD) equivalent oxygen flow, in increments of 20 lpm. The outlet pressure shall be recorded at each of these flow rates. The test procedure shall be repeated utilizing inlet pressures of 1800, 1000, 500 and 250 psig. The reducer shall pass the requirements specified in 3.6.2.1. Appropriate conversion factors for particular gas flow rates shall be used.

4.6.3.2 Type II

The reducer shall be preset at 80 psig (or at the pressure defined in the applicable specification) and the inlet connected to an appropriate oxygen, nitrogen, or air pressure source. The test procedure specified in 4.6.3.1 shall be repeated utilizing inlet pressures of 1800, 1000, 500 and 250 psig. The reducer shall pass the requirements specified in 3.6.2.2. Appropriate conversion factors for particular gas flow rates shall be used.

4.6.4 Shut-Off Valve

4.6.4.1 Type I

The reducer shall be connected to an appropriate oxygen, nitrogen, or air pressure source and the reducer subjected to an inlet pressure of 250 psig. The shut-off valve shall then be turned to the “on” position, and the flow recorded. The inlet pressure shall then be increased to 2400 psig. The reducer shall be turned to the “off” position and the flow recorded. The torque required to open and close the valve shall also be noted. The reducer shall pass the requirements specified in 3.6.3.1. Appropriate conversion factors for particular gas flow rates shall be used.

4.6.4.2 Type II

The reducer shall be connected to an appropriate oxygen, nitrogen, or air pressure source and the reducer subjected to an inlet pressure of 250 psig. The emergency supply release assembly shall be actuated and the flow recorded. The inlet pressure shall then be increased to 1800 psig. The pull force required to actuate the emergency supply release assembly shall first be measured and recorded with zero pressure applied to the outlet of the reducer, and again after resetting the reducer, with 90 psig from an external source of oxygen applied to the outlet of the reducer. The release assembly shall be engaged and the flow measured with an inlet pressure of 1800 psig. The reducer shall pass the requirements specified in 3.6.3.2. Appropriate conversion factors for particular gas flow rates shall be used.

4.6.5 Pressure Relief

A pressure of 1800 psig shall be applied to the inlet of the pressure regulating valve. An increasing pressure shall then be applied to the outlet of the valve until the relief valve opens. The relief valve opening pressure shall be noted. The pressure at the outlet of the relief valve shall then be adjusted to 130 psig (or otherwise specified value) and the flow rate through the relief valve shall be noted. The valve outlet pressure shall then be decreased until the relief valve closes as evidenced by the absence of exit flow through the relief valve. The relief valve closing pressure shall be noted. The valve shall pass the requirements specified in 3.6.4. Appropriate conversion factors for particular gas flow rates shall be used.

4.6.6 Proof and Burst Pressures

4.6.6.1 Proof Pressure

The reducer shall be connected to a nitrogen or air pressure source and the reducer subjected to an inlet proof pressure of 5/3 X the maximum expected operating pressure as specified in 3.5.1 or 3.5.2, or a value as defined in the procurement specification. The proof pressure shall be maintained for a period of 3 min minimum, and the reducer shall pass the requirements specified in 3.6.5. It is recommended that Oxygen NOT be used in performing the proof pressure test due to the safety hazard present with elevated pressures.

4.6.6.2 Burst Pressure

For qualification of new designs only (not production hardware), the reducer shall be connected to a nitrogen or air pressure source and the reducer subjected to an inlet burst pressure of 2 X the maximum expected operating pressure as specified in 3.5.1 or 3.5.2, or a value as defined in the procurement specification. The burst pressure shall be maintained for a period of 10 min minimum. There will be no catastrophic damage to the reducer. Deformation and/or leakage are permissible. Subsequent to exposure to Burst Pressure testing, the hardware is considered expended and cannot be used in service.

4.6.7 High and Low Temperature Operation

With the reducer in the “on” position but not flowing (using a downstream shut-off valve), a pressure of 1800 psig shall be applied to the inlet of the reducer. The reducer shall then be subjected to a temperature of 160 °F ± 5 °F (71 °C ± 2.8 °C) for 3 h, or at a temperature and duration as defined in the procurement specification.

After the conditioning period and while still at this high operating temperature, the reducer shall be subjected to and pass the pressure and flow tests per paragraph 4.6.3 as well as the Shut-Off functional tests per 3.6.3. The reducer shall then pass the requirements specified in 3.6.6.

The above test procedure shall be repeated utilizing a temperature of -65 °F ± 5 °F (-54 °C ± 2.8 °C) for 3 h, or at a temperature and duration as defined in the procurement specification. During the temperature transition period, the reducer shall be subjected to the Shut-Off functional tests per 3.6.3. After the conditioning period and while still at this low operating temperature, the reducer shall be subjected to and pass the pressure and flow tests per 4.6.3 as well as the Shut-Off functional tests per 3.6.3. The reducer shall then pass the requirements specified in 3.6.6.

4.6.8 Vibration

The reducer shall be mounted in each of three mutually perpendicular axes with an inlet pressure of 1800 psig Nitrogen or Air applied. Oxygen should not be used during the vibration test due to the presence of oils, hydrocarbons, and possible ignition sources. The reducer shall be subjected to sinusoidal frequency sweeps from 5 to 50 Hz with a peak-to-peak displacement of 0.018 to 0.020 in for 1 h per axis. A linear sweep rate of 0.05 Hz/s shall be used. One cycle consists of varying the frequency from 5 to 50 Hz and back to 5 Hz, resulting in 2 cycles per axis, each cycle having a duration of 30 min. During the vibration period, an equivalent oxygen flow of 30 lpm ± 5 lpm shall be maintained through the reducer. The reducer shall pass the requirements specified in 3.6.7. The reducer shall then be subjected to and pass the leakage, pressure, and flow tests. The aforementioned levels and durations, as well as additional requirements for random vibration, shock, and constant acceleration, are subject to revision based upon defined contract and specification requirements.

4.6.9 Endurance (Type I)

The actuating handle shall be manually operated 1000 times, or in accordance with specific program requirements defined in the specification. The reducer shall pass the requirements specified in 3.6.8.

4.6.10 Oxygen Slam-Start Test

The reducer shall be subjected to the oxygen slam-start test to determine compatibility of the item with high pressure oxygen.

4.6.10.1 Equipment

The equipment used in performing these tests shall be in accordance with Figure 1. The main valve shall be a rapid-opening 1/4 in valve, shall require no internal lubrication for operation, and shall be rated for at least 3000 psig operation. The valve shall be leak tight when closed and shall open with such rapidity that at least 95% of the total pressure rise shall have occurred within the test chamber in 20 ms ± 7 ms. The pressure rise time may be determined by measurement with a fast-responding small volume pressure transducer substituted for the reducer in the test setup. The tubing and fitting connecting the valve to the test chamber shall be 3/16 in size and shall be fabricated from corrosion-resistant steel or monel. The length of tubing between the valve and the test chamber shall not be bent more than 4 degrees. The bleed valve shall be of a type which uses no organic material to accomplish its seal and requires no interior lubrication for operation. The bleed valve shall be installed so that when it is closed, the test chamber does not communicate with the packing side of the valve.

4.6.10.2 Procedure (Reducer)

The outlet connections of the reducer shall be sealed. The reducer inlet shall be installed in the test setup shown in Figure 1. The quick-acting valve shall be fully opened and the reducer rapidly pressurized with oxygen to a pressure of 2000 psig. This pressure shall be maintained for 30 s and then released through the bleed valve. The reducer shall be disconnected and examined for indication of charring or deterioration of any nonmetallic material. The valve shall pass the requirements specified in 3.6.9.

5. PACKAGING

5.1 Preservation

Preservation shall be level A or C, as specified (see 6.2).

5.1.1 Level A

5.1.1.1 Unit Packaging

Unless otherwise specified, each reducer shall be cleaned for oxygen service in accordance with ARP1176 and 3.5.3.4, and then packaged in accordance with MIL-STD-2073, Method 30, and/or AIR5742. Contact preservative is prohibited. Each reducer shall be sealed in a bag of MIL-B-22191, Type II material (or equivalent), cushioned to prevent damage and packaged in a waterproof fiber container conforming to packaging standards specified in 2.1. Variation from this methodology may be granted as directed by individual program contract or specifications.

5.1.1.2 Intermediate Packaging

Six unit packs shall be packaged within a fiberboard container conforming to ASTM D 1974. The manufacturer's seam shall be adhesive sealed. All seams and joints shall be sealed with tape conforming to ASTM D 5486. Variation from this methodology may be granted as directed by individual program contract or specifications.

5.1.2 Level C

The reducer shall be packaged to afford the minimum degree of protection necessary to prevent deterioration or damage during shipment under normal environmental conditions and commercial modes of transportation.

5.2 Packing

Packing shall be level A, B, or C, as specified (see 6.2) or per specific contract requirements.

5.2.1 Level A

Unless otherwise specified, sixty reducers, packaged as specified in 5.1.1, shall be packed in overseas type exterior containers conforming to PPP-B-576, ASTM D 1974, or ASTM D 5168, weather resistant class. Closure and strapping of the containers shall be in accordance with the applicable container specification or appendix thereto. The gross weight of the packed shipping container shall not exceed the weight limitations of the applicable container specification.

5.2.2 Level B

Sixty reducers, packaged as specified in 5.1.1, shall be packed in domestic type exterior containers conforming to PPP-B-576, ASTM D 1974, or ASTM D 5168, Domestic Class. Closure and strapping of the containers shall be in accordance with the applicable container specification or appendix thereto. The gross weight of the packed shipping container shall not exceed the weight limitations of the applicable container specification.

5.2.3 Level C

The packaged reducers, which the carrier requires to be packed, shall be packed within exterior type shipping containers in a manner that shall insure safe transportation at the lowest rate to the point of delivery. The shipment shall conform to the minimum requirements of the rules and regulations applicable to the mode of transportation selected.

5.3 Marking

Nomenclature tags shall be inserted in each bag showing title, part number or other data as required by acquiring activity. In addition, interior and exterior containers shall be marked in accordance with MIL-STD-129, AIR5742, ATA Spec2000, and/or specific program requirements.

5.3.1 Precautionary Marking

The following precautionary marking shall appear on each package pertaining to Oxygen-Use Equipment, for example:

“CAUTION: DO NOT ALLOW CONTAMINANTS OF ANY KIND TO BE USED ON OR ABOUT THE OXYGEN PRESSURE REDUCERS”

“Cleaned for Oxygen Service”

“For Oxygen Use Only, Use No Oil”

6. NOTES

6.1 Intended Use

6.1.1 Type I

The oxygen pressure reducer is intended for use in aircraft where it is desired to reduce oxygen at pressures between 250 and 1800 psig to a pressure range of 80 psig ±10 psig at flow rates up to 140 lpm (NTPD). Variations in source and regulated pressures may be tailored per individual program requirements.

6.1.2 Type II

The emergency oxygen pressure reducer is intended for use in bailout systems where it is desired to reduce oxygen at pressures between 250 and 1800 psig to a pressure range of 45 to 80 psig at flow rates up to 140 lpm (NTPD). Variations in source and regulated pressures may be tailored per individual program requirements.

6.2 Ordering Data

Acquisition documents should specify the following:

a. Title, number, and date of this specification.

b. Type required (see 1.2).

c. Fungicidal agent to be used (see 3.3.2.2).

d. Size of thread required (see 3.5.2.2).

e. Whether first article inspection is required and where the sample should be delivered (see 4.3.1).